**Heat resistance test**

Purpose: to make sure the product behaves the same in environments of varying temperatures that it is likely to encounter. Test measures for change in size that may occur as the product is heated.

Materials

* Product
* Hot plate
* Timer
* Paper
* Ruler

Procedure

1. Obtain the materials.
2. Take the product and draw an outline of it on a piece of paper.
3. Use the ruler to measure the length of the product, and make three marks at of the length.
4. Measure the width of the product at the marked points, and record the values in the chart.
5. Heat the hot plate to 100 degrees Fahrenheit.
6. Place the product on the hot plate for 3 minutes.
7. After time is up, remove the product from the hot plate, place it back on the sheet of paper, and outline again.
8. Use the ruler to measure the length of the product, and make three marks at of the length.
9. Measure the width of the product at the marked points, and record the values in the chart.
10. Repeat steps 2-8 changing the temperature in step five to 120 degrees, 140 degrees and 160 degrees.

For a successful product, no changes in the product should occur within the test. The temperature range accounts for asphalt or sand in the summer that are known to reach temperatures up to 140 degrees Fahrenheit.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Degrees (F) | Point A (cm)  Before After | | Point B (cm)  Before After | | Point C (cm)  Before After | |
| 100 |  |  |  |  |  |  |
| 120 |  |  |  |  |  |  |
| 140 |  |  |  |  |  |  |
| 160 |  |  |  |  |  |  |

**Flexibility test**

Purpose: to test that the product has flexibility to ensure that the user experiences comfort when using the product.

Materials

* Protractor
* Ruler
* Marker
* Tester product

Procedure

1. Use the ruler to measure the length of the product, and make three marks at of the length.
2. Set the product flat on a surface and place the protractor against it at the first mark.
3. Fold the product at the mark to 30 degrees, 60 degrees, 90 degrees, 120 degrees, 150 degrees, 180 degrees
4. Observe if the product cracks, or disfigures; note the results in the chart.
5. Repeat step 3 for marks of the product.

|  |  |  |  |
| --- | --- | --- | --- |
|  | Observations | | |
| Degrees | 1/3 Mark | 1/2 Mark | 2/3 Mark |
| 30 |  |  |  |
| 60 |  |  |  |
| 90 |  |  |  |
| 120 |  |  |  |
| 150 |  |  |  |
| 180 |  |  |  |

**Water Absorption Test**

Purpose: To test whether or not our product absorbs water while submerged in it for different periods of time, while also testing to make sure that if any water was absorbed, it is drained within an hour.

Materials

* 4 tester products
* 1 liter of water
* 12 x 8 container
* Towels/Napkins
* Timer
* Scale

Procedure

1. Gather all lab materials.
2. Take one liter of water and pour it into the container.
3. Weigh the tester product.
4. Place the product into the bin of water.
5. Wait 1 minute while letting the product soak in the water.
6. Remove the product after the 1 minute and dump out any water inside.
7. Measure the mass and note the difference.
8. Set the product aside for 1 hour.
9. Measure the mass again after the hour.
10. Repeat steps 2-9 changing the time the product is submerged in water from 1 minute to 5, 10, and 60 minutes.
11. Place all lab materials back.

\*Note: if the product absorbs water leaving insufficient amounts for the next test, it is necessary to fill the container again.

|  |  |  |  |
| --- | --- | --- | --- |
| Time in water (min) | Starting Mass (g) | Ending Mass (g) | Mass after 1 hr (g) |
| 1 |  |  |  |
| 5 |  |  |  |
| 10 |  |  |  |
| 60 |  |  |  |

**Multiple Surface Tests**

Purpose: to test how different surfaces will affect whether or not the sticks to the gum shield.

Materials

* Tester product with shoe
* Five mint Gum
* 5 lb weight
* Timer
* 120-140 lb volunteer
* Surfaces
  + Concrete block
  + Carpet patch
  + Tile
  + Brick
  + Grass patch

Procedure

1. Gather all lab materials.
2. Chew piece of gum for 5 minutes.
3. Place gum on concrete block with 5 lb pressure.
4. Have a person put on the shoe with the product, walk, and step on the gum.
5. Note whether the gum stuck to the gum shield or not.
6. Repeat steps 1-5 with the other four surfaces.
7. Place all lab materials back.

|  |  |  |
| --- | --- | --- |
| Surface Type | Gum Stuck to Product  Yes No | |
| Concrete |  |  |
| Carpet |  |  |
| Tile |  |  |
| Asphalt |  |  |
| Brick |  |  |
| Slate |  |  |